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- ART. III.—1. *The Railway. Remarks at Belfast, Maine, July 4, 1867.* By JOHN A. POOR. Boston. 1867. 8vo pamphlet.
2. *Monthly Circulars of the National Anti-Monopoly Cheap-Freight Railway League for promoting Reform in Railroad Management, by securing Equal Rights and Cheap Transportation, with consequent increased Development of our Industrial Energies and National Resources.* Nos. I. — VII. New York. 1867. 8vo pamphlet.

It is related in the Sussex Archæological Collections, that in 1703, when the king of Spain went to Petworth, his equipage was engaged for six hours in traversing the last nine miles of this journey; and that Sir Herbert Springett went to church in the family coach drawn by eight oxen,—a stately and patriarchal mode, which arose from the necessity of having “the strong pull, the long pull, and the pull all together” of the bovine team, to which the power of horses is as naught.

The excellent roads of Telford and McAdam made a great change in England before the end of the eighteenth century, for there were by that time some thirty thousand miles of highways in Great Britain on which the traveller could, if he chose to pay for such a luxury, drive at the rate of twelve to fifteen miles an hour, with perfect ease and safety. And half a century before the journey alluded to above, a primitive sort of railway was in use at the coal mines in the North of England; but it was not till the completion of the Liverpool and Manchester Railway, in 1830, that the present system of railway travelling was fully introduced.

Forty-two years since, George Stephenson built the first locomotive employed on a public railway; and that engine, by the way, may now be seen, after having “run” till 1846, carefully preserved as a relic, on a pedestal in front of the Darlington station of the Stockton and Darlington Railway, in England. Every one is familiar with the story of the Stephensons, the “Rocket,” and the Liverpool and Manchester Railway. Mr. Poor, the author of the pamphlet the title of which is at the head of this paper, tells us that it was his own

“good fortune to witness” one of the early experiments in railway locomotion in this country.

“The Boston and Worcester Railroad Company imported from Newcastle-upon-Tyne one of George Stephenson’s locomotives, — not unlike those placed upon the Bangor and Oldtown Road in 1836, — small in stature, but symmetrical in every particular, and finished with the exactness of a chronometer. Placed upon the track, its driver, who came with it from England, stepped upon the platform with almost the air of a juggler or a professor of chemistry, placed his hand upon the lever, and with a slight move of it the engine started at a speed worthy of a companion of the ‘Rocket,’ amid the shouts and cheers of the multitude.”

And he adds in another place : —

“The locomotive came upon the world like a miracle. All previous modes of land conveyance were slow and cumbersome. As the pack-horse relieved the solitary foot-passenger, so the common wagon, the pleasure-carriage, and the stage-coach came in its time to man’s relief ; but the greatest of all the means of transportation, the locomotive engine, produced in the lifetime of a single generation greater results affecting man’s physical and social condition than all the agencies of previous times.”

Those of us who recollect the discomforts of a long journey by stage-coach, — for instance, from Albany to Buffalo, or, by canal and coach, from Philadelphia to Pittsburg, — and who happen to have lately made the same journey comfortably seated in a “monitor” or “palace car,” will cordially unite with Mr. Poor in this tribute to the genius of the man who invented the first successful locomotive engine for passenger conveyance.

Since the days of the “Rocket,” the power of the locomotive engine has been enormously increased, by giving the engine greater weight and dimensions, and by certain improvements which have naturally followed its introduction to general use. It can now drag a heavy train, on a good railway, at the rate of sixty miles an hour ; and, with such a load, can maintain that great speed without stopping for sixty miles and more. It can pull a load of one thousand tons at a slow rate ; and it can even ascend and descend mountainous roads, long considered impracticable to any motive power less docile and sure-footed than pack-horse or mule.

In outward form it varies with its various uses. There are the beautifully made "express engines"; the ponderous machines of the Pyrenean and German lines; those for the fast trains of the "London and Northwestern," with their seven and a half and eight feet "drivers," the mammoths of the broad gauge; the many-wheeled mountain engine of the Alleghany inclines; besides a great many others, "passenger" or "freight." *

But the locomotive is not all. Without the rail, the progress of the engine would be slow, and its tractive force limited. Yet the railroad of 1867, at least in this country, is much more nearly like that of 1834 than are the locomotives of those dates. Improvements in the road have not kept pace with those in motive power and rolling stock. Of this, however, more hereafter. We will now proceed to avail ourselves of the statistics given by Mr. Poor, in connection with some others, in order to point out a few of the remarkable results which have followed the introduction of railroads, and then to make some remarks in reference to that reform the author of "The Railway" considers so urgent.

Of the 95,727 miles of railway which had at the end of the year 1866 been built in the world, — "a vast achievement for a single generation," — nearly 37,000 are, according to Mr. Poor, in the United States. But it must be remembered that the railways of the United States are, with comparatively few exceptions, single lines, while a large proportion of those in Europe are double lines.

Although such estimates are more curious than useful, it may perhaps convey some idea of the labor of constructing the 37,000 miles of railroad of the United States to state that it is estimated that the iron used weighed near four millions of tons; that at least six hundred square miles of forest have been cleared for the purpose of obtaining sleepers and other timber needed; and that, if the material which has been moved in the process of construction were spread over the largest city in the Union, it would bury it as completely as Pompeii and Herculaneum are now buried! But most minds will perhaps

* Mr. Marsh, of Boston, is building a railway of extraordinary inclination up Mount Washington, in the White Mountains, which is to be traversed by a locomotive he has patented.

better than in any other way appreciate the skill, energy, and industry bestowed upon these railways, by knowing that they have cost no less than fifteen hundred millions of dollars.

Between the Atlantic cities and the valley of the Mississippi, from north to south, the country is so completely covered with railroads, intersecting each other in every direction, that it would now be impossible to describe even the great routes without the aid of a map. It is enough to say that they have been for the most part admirably projected so as to facilitate the business operations of the country, and for the great convenience of the traveller; and that, although there may have been a great deal of wasteful expenditure, and many unwise schemes, the system as it now exists is a magnificent one, sufficiently comprehensive for the present moment, yet being constantly extended as rapidly as there seems to be occasion for its extension. Besides the lines eastward of the Mississippi, several are advancing towards the west, far beyond that river. The Great Pacific Railway is reported to have reached within a few miles the base of the Rocky Mountains. California is building towards the east, and St. Paul, at the extreme northwest, is now connected by rail with Chicago.

Railway engineering at the present day is so well understood that its practice is easy, except where unusual natural obstacles occur. Thirty years ago the case was different. It was then a new branch to the profession of the engineer. Its principles had to be discovered and applied, — here at least on a grand scale, but with inadequate means; and the bold engineering of the great lines leading from the Atlantic to the West is a satisfactory as well as striking illustration of the ability with which those principles were applied by such men as Knight and Latrobe, McNiel, Whistler, the Robinsons, and Judge Wright.

It is to be regretted that there is no complete and uniform system of returns for working expenses, gross receipts, &c. required by the general government, similar to those of some States; but the latter will afford means of showing results from which the magnitude of the general railway interest may be inferred. Take, for instance, the returns for the State of New York, where, in 1865, there were 3,089 miles of railroad, having

cost on an average \$50,000 per mile, and earning a gross revenue of \$14,157 per mile per annum. Take the gross earnings of the 1,254 miles of railroad in Massachusetts, returned for 1866, which were \$21,205,527, or \$16,910 per mile per annum, their average cost per mile having then been \$63,370. The gross earnings of the New York and Erie Railroad for 1866 were \$15,372,809; and those of the Pennsylvania Central Railroad for the same year, including branches and leased lines, were \$19,124,934. In 1864 the gross earnings of the 5,000 miles of railroad in Illinois were \$8,000 per mile per annum.* Mr. Poor shows how wealth is created by building railroads, citing Ohio statistics as an illustration of the principle.

“Ohio is to-day the third State in the Union. In 1841 her valuation was but \$128,353,657; in 1847 she had 262 miles of railway only; in 1850, 575 miles; in 1860, 2,999 miles; and in 1866, 3,402 miles.

“Her valuation for taxation rose to \$433,872,632 in 1850, to \$860,877,354 in 1855, and to \$959,867,100 in 1860, with an actual valuation in 1860 of \$1,193,898,422, against an actual valuation of \$504,726,120 in 1850,—an absolute increase of \$689,172,300; while her 3,402 miles of railway cost only \$135,231,975. Ohio allowed towns, cities, and counties to aid railroads, and you see the result.”

An extract is also given by Mr. Poor from an article prepared by the editor of the “*Railroad Journal*” in 1852, part of which we copy, as an example in a different form of the same principle:—

“Upon the ordinary highways the economical limit of transportation is confined within a comparatively few miles, depending of course upon the kind of freight and character of the roads. Upon the average of such ways the cost of transportation is not far from fifteen cents per ton per mile, which may be considered as a sufficiently correct estimate for the whole country. Estimating, at the same time, the value of wheat at \$1.50 per bushel, and corn at seventy-five cents, and that thirty-three bushels of each are equal to a ton, the value of the former would be equal to its cost of transportation for 330 miles, and the latter 165 miles. At these respective distances from market neither of the above articles would have any commercial value with only a common earth road as an avenue to markets. But we find that we can move property upon railroads at the rate of 1½ cents per ton per mile, or for

* The Great West.

one tenth the cost upon the ordinary road. These works, therefore, extend the economical limits of the cost of transportation of the above articles to 3,300 and 1,650 miles respectively.

“At the limit of the economical movement of these articles upon the common highways, by the use of railroads wheat would be worth \$ 44.50, and corn \$ 22.27 per ton ; which sums respectively would represent the actual increase of value created by the interposition of such a work.”

We may add, in connection with the above, that the old highways of the country were invariably almost impassable for weeks together at certain seasons, and that the regular daily transmission of passengers and goods throughout the year, without serious interruption, is one of the greatest benefits conferred by railroads.

But so much has been written elsewhere on the advantages of the railway system, that we do not think it necessary to attempt to do full justice to the remarks of Mr. Poor by making further extracts from his pamphlet. Indeed, to readers interested we advise a perusal of the pamphlet itself. A mere allusion to the enormous interests involved will be a sufficient introduction to the suggestions we have to offer respecting reforms in railway management. One more extract from “The Railway” leads to the question. Mr. Poor says that the “vast sums wasted in the construction of railroads, through ignorance and inexperience, are of trifling amount compared with the waste now going on in railway management.”

As was perhaps unavoidable under the circumstances, there has indeed been a great deal of money lost in railroad building, through ignorance or otherwise ; but it is too much the custom to blame the engineers who were early connected with that work for insufficient estimates, extravagant expenditures, and so forth. And if the railroads which were designed by and built in this country under the direction of the engineers so referred to are now compared, as to their fitness for the purpose intended, and even as to their cost relatively with the profile and geological character of the country through which they pass, with some, indeed with nine tenths, of the lines subsequently built in the same field of operations, after valuable information gained by experience in every department

connected with the work of construction was available, we venture to assert that the injustice of such censure will be apparent. The truth is, so many lines were projected about the same time, that many persons took advantage of the demand, and exercised the calling of the civil engineer, who did not possess the necessary scientific attainments, and were not trustworthy in regard to contracts, their position making them the umpires in questions involving very large sums. The consequence was, that contractors, or unscrupulous directors, having their own special objects in view, were shrewd enough to take advantage of the deficiencies of such men ; and the works under their charge suffered accordingly, both in design and execution. The large fortunes of some contractors would not have been made under other circumstances. Nor would certain lines have been located as they are, had their engineers been men of sufficient character and ability to influence a choice of location independently of all interests except those of the general body of the shareholders.

Defective construction is, without doubt, one of the important elements which now affect the cost of transportation. The gradients on some railroads will be found, on examination, to exceed in inclination the rate intended to have been adopted as a maximum, and to secure which the contract prices were paid. Curves are irregular, and sharper than they were supposed to be, work and materials inferior to those contracted for have been accepted, ballast put down unfit for the purpose, and not so deep as intended, and so on. It does not require much knowledge of the subject to perceive that these are lasting evils, which the railway management of to-day has to meet as well as it can ; and though a judicious system of road repairs might set these things, in a great measure, right after a time, few companies have hitherto adopted such a system.

An investment in the shares of any railroad having its construction account closed, and with a well-established through and local traffic sufficient for its profitable support, ought to be perhaps more popular than an investment of any other kind, owing to its security and convenience ; but it is not so, for very apparent reasons. As with the building, so with the management. In many instances railroad managers have neither the

ability nor the honesty — or if the one, not the other — needed to give confidence to persons who seek security, as well as a good percentage for their capital.

There seem to be, indeed, some peculiarly demoralizing influences about the position of a railroad official. The possession of great power over men and money by individuals previously unused to anything of the sort may have had a bad effect. At all events, there have been, from time to time, painful exposures, and, no doubt, many disgraceful pecuniary transactions unfortunately not made public. When the over-issue or “watering” of stock, defalcation, or other robbery, is found out, there is some stir in the railroad world for a few days; but, so used is it to such occurrences, the excitement does not last long, and the whole affair is soon forgotten, except by the immediate sufferers. In order to eradicate this serious defect in railroad management, public sentiment must change; for the mild punishment of simply inducing the delinquent to make the loss good as far as possible, when he is found out, does not seem sufficient to cure the evil.

It is not to be inferred from the foregoing remarks that there are no men of high integrity engaged in railroad management. The contrary is eminently the fact. We have the pleasure of knowing most honorable railroad presidents, and other most conscientious railroad officials; but capitalists have not always the means of discriminating, and men of high character suffer in reputation from a state of things too notorious to need further remark.

We have already seen the figures which indicate the large sums annually earned by some of the great railroad companies; in other words, their gross revenue. It may be worth while to set against them the corresponding “working expenses,” the one taken from the other leaving, of course, their net revenues.

The gross receipts of the Pennsylvania Railroad Company, which now has no less than 358 miles of double track main road, and works or leases several branch or other lines, were, in 1866, \$19,124,934. The total working expenses of the company for that year, including the cost of working the Philadelphia and Erie Railroad, which seems to have re-

sulted in 1866 in loss, owing to the bad condition of the line, were \$13,436,075. Excluding the Philadelphia and Erie Railroad, the gross earnings of the Pennsylvania Railroad, together with the other lines worked by the company, were, in 1866, \$16,583,882, and the total ordinary working expenses were \$10,616,362. The extraordinary expenses of the company, i. e. additional second track, and sidings, locomotive cars, &c., were \$2,174,547. The ordinary expenses for working and maintaining the company's roads are set down at 64 per cent of their revenues.

The income of the Erie Railroad of New York was, in 1866, \$15,372,809. The working expenses, exclusive of internal revenue taxes, \$11,503,153.55, or a little more than 74 per cent of the earnings.

The earnings and receipts, or gross revenue, of the New York Central for 1866 (the year, as with the other New York lines, ending the 30th of September), were \$14,596,785, and the corresponding working expenses were \$11,013,441, being 75.45 per cent of the gross earnings.

The income of the Hudson River Railroad was, in 1866, \$4,845,526, and the transportation expenses \$3,050,426,—nearly 63 per cent.

All the lines above named seem to have open construction accounts; the total cost of road and equipment of the Erie Railroad having been in 1865, \$45,879,522, and in 1866, \$48,507,544; the cost of road and equipment of the New York Central in 1865, \$33,701,919, and in 1866, \$34,133,911. That of the Hudson River, also including equipment, in 1865, was \$15,264,586; and in 1866, \$15,543,825.

The total earnings of the railroads of the State of New York, as returned, for the year 1866, were \$49,812,448, and their working expenses were \$37,640,588. The average working expenses 75.99 per cent of the earnings.

The total earnings of the railroads of the same State were in 1862 \$25,722,473, and their working expenses \$15,220,187, or a little more than 59 per cent.

In 1863 the total earnings were \$31,767,208; working expenses, \$19,230,490, or a little more than 60½ per cent.

In 1864, total earnings, \$39,597,520; working expenses, \$27,453,894, or 69.3 per cent.

In 1865, earnings, \$46,568,411; expenses, \$36,893,326, or 79.2 per cent: the percentage in 1866 being, as before stated, 75.99 per cent.

The total earnings of the railroads of Massachusetts were, in 1866, as stated by Mr. Poor, \$21,205,527; and their working expenses, \$14,534,236, or 68½ per cent. The total income of the Massachusetts railroads for 1864 was \$16,478,596; and the corresponding cost of working, \$10,496,978, or 63.7 per cent.

The common estimate formerly was fifty per cent for working expenses, but this is now much too low; seventy per cent of the earnings is nearer right; so that it has become a question whether the comparatively moderate earnings of ten years ago were not more desirable than the larger revenues of the present time. Organization, structures, and equipment which were sufficient for a small business may not be perfect enough for a large one. The payments for dividends by the New York companies were,*

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| In 1864, | \$ 5,443,384 |
| “ 1865, | 4,624,786 |
| “ 1866, | 4,093,618 |

while their gross earnings were

| | |
|-----------|--------------|
| For 1864, | \$39,597,520 |
| “ 1865, | 46,568,411 |
| “ 1866, | 49,222,223 |

That it is important to reduce “working expenses” is evident, but any effort to economize in this way will only succeed by means of better organization, by the adoption of every mechanical improvement applicable to the system, by repairing, renewing, or rebuilding, in a scientific manner, and by employing the best men available for the service.

The managing and operative systems of some of the great companies are already well arranged, and ought to be imitated as far as possible by the lesser ones. It is hardly necessary to say that, if the president of a railroad company is expected to be an executive as well as an administrative officer,

* The figures relating to the New York railroads are from the Report of the State Engineer.

he ought to be practically acquainted with the details of the business he has in charge, and also familiar with the construction and working of the line and its equipment, by means of which that business is to be done. Otherwise he can be of very little use in directing the men who act under him at the heads of the several departments, or in controlling the expenses of those departments.

It is equally evident that, if the superintendent is the principal executive officer, he should of course possess the indispensable qualifications specified above. But there are a great many men now at the head of railroad companies who have worked themselves into office by their own or their friends' manœuvring; who had, at the time of their election, no peculiar fitness for the place, little knowledge of the common details of railroad traffic, and none whatever of the more important principles which should guide railroad operations; and who have consequently learnt the little they now know about such matters at the cost of their employers, the stockholders. Mechanical knowledge is the last thing learnt by such men. Their tastes lead them in another direction. They are not superior to the preparation of clap-trap advertisements, representing their lines as the shortest and cheapest routes, or to underhand negotiations for the purpose of diverting freight from rival lines. Among this class of railroad presidents are likely to be found the individuals who make use of the earnings of the line, the line itself, and the property belonging to it, as their own, and who indirectly, no doubt, do a great deal more harm by setting a bad example to the companies' under-agents, conductors, &c. It is said, indeed, that very large sums, in the aggregate, are annually lost by some railroad companies through the petty pilfering of the conductors,—a sort of robbery there is no effectual security against, except in the character of the men themselves, so long as it is found convenient to take fares in the trains. If the president's "irregularities" are known to his subordinates, and it may be safely assumed that in nine instances out of ten they are known to them, the conductor or other agent who is also dishonest feels more than ever safe against detection.

A secondary evil, though a very serious one, is that of

permitting president or director to be interested in furnishing new rails, or other "supplies," as a seller to his own company. Such sales may be made at the lowest market price, or even lower, but they put a stop to competition, and also to a rigid inspection on the part of the company of the material so furnished. It is impossible for the principal officer, who profits as a merchant by a sale to his own company of thousands of tons of railroad iron annually, to object to indirect receipts of the same kind, though far less in amount, taken by every one of the company's agents who may have in one way or another an opportunity in some degree similar. It is believed that many railroad agents not only have the opportunity, but avail themselves of it, to the serious injury of the stockholders. But this is not the disposition of most of that large and useful class of men. Their way of life is laborious and full of responsibility, their duties are well performed, and the wages they receive are fairly earned. It may be added, that there are numbers of men employed upon every railroad whose occupation removes them from the temptations we have referred to, and whom we have every reason to believe, judging from what we have seen of them, as conscientious, and in their sphere as respectable a body as any other in the community.

Generally speaking, no reduction can be made in the number of men employed by railroad companies. On the contrary, the public would be better served if their number were increased. Neither can wages be lowered, as they are not high when compared with the wages now paid for other kinds of labor. But we think very considerable saving may be effected by more judicious application of the large sums which are now annually spent for road repairs and renewals, so as to make the road-bed and superstructure as perfect as possible, and thus economize in power and wear of rolling stock. Upon most lines great improvement may be brought about in this respect, because there are a great many railroads in the country, after excepting some of those forming the great routes, upon which there is no officer connected with the management who is theoretically or practically acquainted with the mechanism which forms a well-built railroad of the present day. General ignorance of what has been done at a dis-

tance by engineers who make railroad engineering their special pursuit is not to be wondered at under such circumstances, and rails on some lines may therefore be seen which have been renewed over and over again, yet remain to-day almost the same in cross-section and fastenings with those first laid down upon them, as if the experience of twenty or thirty years afforded no guide to a form and application better fitted to bear the heavier engines and other rolling stock now in use.

And again, as regards quality. The rails of the past fifteen or twenty years have in most cases proved far inferior to those used at first. The reason of this, we suppose, is because the specifications under which the first rails were contracted for were drawn up by men who knew something about the manufacture of iron and its application to the making of rails, a price being paid accordingly, while the more modern contracts were simply for "rails," at the lowest possible rates. It is not too much to say that rails can be made at a profit to the manufacturer, which will stand the inspection of the authorities of many railroad companies, for a price thirty-three per cent lower than the price good rails would command. We must add, on the other hand, that praiseworthy efforts have been made for some years past, by some railroad companies, to secure by means of the improvements of the day a smoother and more durable superstructure for their trains to pass over, and new methods of construction or adaptation may be seen upon them, obviously and essentially better than the old ones, which improved methods ought to be generally adopted for the sake of economy and public safety, unless other better ones are in use on some other lines, or can be devised. Indeed, until all such improvements, within reasonable limits as to cost, have been generally introduced, the most obvious and easy step towards economy will have been neglected.

For railroads upon which such simple matters as thorough drainage, good ballast, and a tolerably perfect superstructure would add fifty per cent to the duration of their iron rails, the use of steel instead of iron seems needless refinement. Nevertheless, the question of laying down steel rails has of late attracted attention, and companies able to afford the expense are now trying them, with advantage to their own interests,

as well as to public security and comfort. Steel tires and steel boilers may follow next.

A paper on the "Maintenance and Renewal of Permanent Way"* was read last year by R. Price Williams before the Society of Civil Engineers of England, and subsequently printed with "an abstract of the discussion upon the paper," by order of the society.

It has already been translated into French, and a few copies have found their way to this country. It contains valuable information relating to the Bessemer steel rail, in connection with its general subject. We venture to make one or two extracts, but the paper itself should be read.

"The introduction within the last few years of steel rails, manufactured chiefly by what is known as the Bessemer process, and the highly satisfactory nature of the results obtained, encourage the belief that at length a material has been obtained which was alone wanting to give something like real permanency to that which in name only has hitherto deserved the title of 'Permanent Way.'

"In 1862, some steel rails were laid at the Camden Town and Crewe stations of the London and Northwestern Railway, where, from the excessively heavy character of the traffic, iron rails were usually worn out in the course of a few months. Two 21-foot steel rails laid on May 2d, 1862, at the Chalk Farm Bridge, side by side with two ordinary iron rails, were, after outlasting sixteen faces of the iron rails, taken out in August, 1865; and the one face only, which had been exposed during a period of more than three years to the enormous traffic, amounting to something like 9,550,000 engines, trucks, &c., and 95,577,240 tons, although evenly worn to the extent of a little more than a quarter of an inch, still appears to be capable of enduring a good deal more work. . . .

"The general adoption of steel rails on main lines where the traffic is of the heavy description referred to, will, in the opinion of the author, not only prove cheaper in the end, but, what is of infinitely more importance, will, through the less frequent breaking up of the road, materially add to the safety of the travelling public. It will also, in a corresponding degree, lighten the great weight of anxiety and responsibility which attaches to the resident engineer, who, morally at least, is held accountable for all the accidents that occur through defects in the permanent way under his charge."

* "Permanent Way" would here be called "Superstructure" or "Track."

So long as an open construction account is kept, it will be difficult to find out what the real cost of working is, for, even with the best intentions on the part of the auditor, the difference between charges which should be debited "construction" and those properly chargeable to "working expenses" is often indistinct. New equipment, new stations and bridges, and new "superstructure," all better or on a larger scale than the old, may in some cases fairly belong to construction, or perhaps part of the outlay may belong to one account, and part to the other. It may be very troublesome to draw the line strictly. In short, it is easy to see that, when the figures are to be entered, there is a strong temptation to make as favorable a report as possible for the sake of a dividend, which dividend, whether it has really been earned or not, is to fix the market value of the shares for the next few months. This is one view of the case; but sometimes it happens, we believe, — in fact, such transactions are so openly talked about that it is not to be supposed they are generally considered improper, — that a dividend is paid by order of a board of directors, while there is no pretence that it has been earned, and where prudent regard for the future interests of the stockholders ought to have precluded its payment. As the amount of the semiannual dividend is, in the estimation of the ordinary purchaser of stock, the measure of the value of what he buys, a payment by the company of an unearned dividend, or of one improperly large, may lead him to invest under a false impression created by public misrepresentation. Railroad "financiering" did a great deal of mischief while railroads were building. It would be difficult to say what the phrase meant at that time, but in connection with railroads in operation it can only mean harm; for the absurdity of supposing extraordinary skill in money matters to be needed in the management of a railroad company has long since been apparent. The money has to be properly taken care of when earned, properly distributed, and clearly accounted for. Less book-keeping even would often be an improvement, with the introduction of accounts admitting statements simple and clear enough to satisfy the mind of any anxious proprietor. Nothing beyond the skill of a good accountant is really needed for this, and the rest is essentially mechanical.

Travellers from this country notice the difference between the European railway system and their own, and naturally compare the two systems as to economy, safety, speed, and comfort; but a contrast to what one is accustomed in travelling is very likely to be at first disagreeable, and this should be recollected when we are informed by letters or the newspapers that the American system is superior to the European system, particularly to that of England,—England usually affording the first opportunity for the observation. This sort of criticism is too hastily made to be serviceable; indeed, it does much harm, for it tends to make people overlook defects that might otherwise be easily remedied. We mean to say that there are some things connected with railroad travelling here which might be altered for the better, for the purpose of making it safer and more comfortable. As to economy, no traveller can possibly find fault with the passenger fares; nor can the “shipper” of freight reasonably complain of the usual freighting charges; and the speed is great enough at present. In fact, it must be admitted that the American Railroad System, as it is called, is already admirably adapted to the wants and habits of a great majority of the persons who travel by means of it, and also that it is, as a whole, much better suited to this country than the European system would be. And as much may probably be said of the European system. For it is already nearly the perfection of locomotion, according to the ideas of comfort and convenience prevailing with the people who use it most. But, after all, there are some details common to both systems which it will be worth while to compare, in the hope of attracting attention to something or other that may be considered worthy of imitation.

The question of safety would probably be the last one likely to weigh upon the mind of the railway traveller of the present day on entering a train; yet many passengers habitually buy their life-insurance tickets with their car tickets, and the business of railroad life-assurance is said to flourish exceedingly.

We are unable to give the number of accidents occurring on the 37,000 miles of railroad of the United States in any one

year, or even on any large part of the whole ; but if we take the statistics of accidents from the New York and Massachusetts returns for 1866, which are the only ones we happen to have at hand, — and they are probably as favorable for the purpose of comparison as the statistics of accidents for a larger number of States would be, — it will be seen that there were in those two States in that year, or, more precisely, in the twelve months embraced in that year's returns, 30 passengers killed, 112 passengers injured ; 286 employees and others killed, 160 employees and others injured ; a total of 316 passengers, employees, and others killed, and 272 passengers, employees, and others injured. A grand total of 588 persons either killed or injured during the twelve months on the railroads of New York and Massachusetts. They consist of but some 4,350 miles of the 37,000, and it is not to be imagined that they are managed with less regard to public safety than are those of the other States of the Union, though it is probable the number of passengers upon them is considerably larger in proportion to the mileage than is the case in most other States.

The number of passengers of all classes in New York and Massachusetts, for 1866, was 40,381,514 ; consequently one passenger was killed for every 1,346,050 passengers carried, and one passenger was either killed or injured for every 284,377 passengers carried.

The whole number of miles travelled by the trains, passenger and freight included, was 32,833,967 ; so that one life was lost of employees and others for every 114,804 miles travelled by trains, and one person exclusive of passengers was either killed or injured for every 73,619 miles travelled by the trains, — the miles travelled by the trains, of course, indicating the extent of accommodation afforded to the public. We will compare these figures with corresponding ones deduced from the railway returns of Great Britain and Ireland for 1862, as those are the only ones for the United Kingdom we have by us of so late a date. The comparative statistics of railway accidents in France, Germany, and Belgium would most likely be in favor of the Continental lines over those of Great Britain and Ireland ; but the case, as it is, will be found sufficient for our purpose.

Indeed, the system of management in the French lines is extremely precise and rigid, — probably the perfection of organization, — and the consequence is that they are very safe, as well as very profitable ; but persons used to the great personal freedom of movement possible when travelling by train here might perhaps prefer to continue to incur the risk so much moving about causes, rather than bear the restraint that in some measure secures greater safety.

The whole number of passengers killed on the railways of Great Britain and Ireland in 1862 was 35, and there were during the same period 536 passengers injured. There were also 181 servants of companies or of contractors, trespassers, and others killed, and 64 injured. The distance travelled by the trains was 108,061,797 miles ; and the total number of passengers carried — assuming that each holder of a season ticket made three journeys a week throughout the year — was, say 197,400,000. That is to say, one passenger was killed for every 5,640,000 carried ; one passenger either injured or killed for every 345,709 passengers carried ; one servant of company or contractors and others killed for every 597,026 miles travelled by the trains, and one servant of company, &c. either killed or injured for every 441,068 miles travelled by the trains.

If, therefore, the year 1862 for Great Britain and Ireland, and the year 1866 for New York and Massachusetts, are not exceptional ones, the ratio of accidents in proportion to public accommodation under the two systems is very nearly as below, viz. : —

- 21 passengers killed in New York and Massachusetts for 5 in Great Britain and Ireland ;
- 6 passengers either injured or killed in New York and Massachusetts to 5 in Great Britain and Ireland ;
- 21 persons other than passengers killed in New York and Massachusetts for 4 in Great Britain and Ireland ;
- 6 persons other than passengers either injured or killed in New York and Massachusetts to 1 in Great Britain and Ireland.

The returns from which the above figures were drawn do not in all cases specify the number of passengers whose deaths were due to causes quite beyond their own control ; some of

the passengers in the list having been killed in consequence of their own carelessness. To show how secure a railway passenger may be if he exercises proper caution, we copy a paragraph from a paper* lately read before the "Inventors' Institute" in England:—

"In conclusion, I may observe that travellers are by no means aware of the almost daily improvements that are going on throughout the entire rolling stock and permanent way of railways. They would more fully appreciate these if they could run out of a first-class line at a high speed on to one of the old, original lines, such as the Liverpool and Manchester, with its rattle and jolting. Now, indeed, it is far more safe for one to be continually travelling, than to pass an active life under any other conditions. This statement is borne out from the official returns of the persons whose deaths were due to causes beyond their own control on the railways of the United Kingdom. The number has decreased from 38 in 1844 to 23 in 1859, and to only 15 in 1864, while the numbers that travelled during the last-named year amounted to the enormous figure of 229,350,000, or nearly eight times the whole population of the kingdom. Thus, the chance of death is 1 to 15,290,000, which may be taken practically as no chance at all. Let this be compared with the liability to fatal accidents from horse conveyances in London alone, with its population of nearly 3,000,000. By the returns from the Registrar-General's office, during the year 1865 there were 215 persons killed by horse conveyance, or 1 in every 14,000 of the population. The railway return already quoted gives 1 in every 2,000,000 of population, or 1 in every 15,290,000 of travellers. So that, taking the estimate by population, the railways are 150 times more safe than the streets of London."

So much for the relative safety of the two systems. Now as to their relative speed, for the rapidity with which a train passes over the rails influences its own safety directly and indirectly in many ways, though the result of a single accident occurring to it might, under some circumstances, be as disastrous if it travelled slower. The management and system suited to high speed, therefore, must be in every respect more nearly perfect than they need be if the speed were not so great, in order to maintain an equal degree of security to passengers and the public.

* By Robert Richardson, C. E.

Very great speed is made occasionally in this country, when a train is late, and its engineer is allowed to make up time, as it is called, at his own discretion ; but there are no lines in the country, we believe, on which as high speed is regularly maintained as would be within the power of the engines, were the rails in as good order as they might be, and were the system more complete in its organization and appointments. Indeed, if a foreign engineer were to walk over some of the railroads which are supposed to be as safe as any others in the country, and examine their structures critically, possibly seeing a road-bed half covered with grass, sleepers so much decayed that the rail fastenings are quite loose, joints now and then much too wide open, and shaken masonry, he would pronounce, without hesitation, that it would be impossible to maintain high speed upon them with any degree of safety or economy whatever. Thirty-three miles an hour, including stops, is good regular speed here for an express train, for a stretch of one hundred miles, though much higher rates are sometimes made,— we will add, “at the imminent risk of accident” ; while to show what railway travelling may be made as to speed, where line and rolling stock are both as perfect as modern science and money can make them, we must again refer to France or England. We are not writing with “time-tables” before us, but we should say that forty miles an hour, excluding stops, is not far from the speed of the quickest French trains for long distances, and that with the most perfect steadiness of motion and ease to the passenger conceivable. In England, fifteen years ago, the express trains of the Great Western Railway were making their trips, with the regularity of the hands of a clock, at fifty miles an hour, including stops ; the actual speed required to do this being often at the rate of sixty miles an hour, mile after mile. The narrow-gauge railways were obliged to emulate the speed established by Mr. Brunel and the Great Western, so that the speed of the fast trains of the several lines named below, which are run between the points indicated without intermediate stops, was very lately noted from personal observation, or taken down from official published tables, as follows :—

| | Miles. | h. | m. |
|---|--------|----|----|
| Brighton and South Coast, — London to Brighton, | 50 | 1 | 5 |
| London, Chatham, and Dover, — London to Dover, | 88 | 1 | 55 |
| London and Northwestern, — London to Rugby, | 82½ | 1 | 50 |
| Chester to Holyhead, | 84 | 2 | 7 |
| Great Western, — London to Swindon, | 77½ | 1 | 30 |
| Great Northern, — London to Peterborough, | 76½ | 1 | 37 |
| London and Southwestern, — London to Basingstoke, | 48 | 1 | 10 |

This fast travelling is of course expensive, especially as a great deal of attention is paid to the comfort of the passenger, as well as to his safety; and the fares in the first-class carriages are accordingly high. The mechanical arrangement of these carriages is very complete; and although there is a vibratory movement differing from the long, easy swing of the cars here, there is on the whole less motion felt by the passengers by fast trains there than here, particularly when the passenger by train here happens to find himself seated near either end of a car. The average fare, if we take the rates upon a few of the great railways as an example, is not far from 2.22 *d.* per mile for first class, 1.66 *d.* per mile for second class, and a little less than a penny per mile for third class, by ordinary trains; while by express train — these trains carrying no third-class passengers — the rates are not far from 2.6 *d.* for first class, and 1.92 *d.* for second class. On the New York railroads the average passenger fare per mile, for 1866, was 2.42 cents; from 2.4 cents to 3.5 cents per mile being perhaps the most common rates throughout the country, for considerable distances.

While alluding to fares, and as an instance of extremely low rates, it may be interesting to notice what has been done within a few years past in India, where the English railway system has been established. Very large districts of British India offer great advantages for railroad operations in some respects; though, on the other hand, there is the necessity of employing, for the present, a great number of Europeans at high wages in working the lines, and also of often using very expensive fuel. The railways are well built, with bridges of masonry or iron, and have heavy rails, sometimes of steel. There were opened for traffic, up to May 1, 1866, 3,302 miles, of which only 250 miles were at that time made with a double line.

The general character, where the country admits of good gradients, may be judged of from the fact that the distance between Calcutta and Delhi, which is 1,020 miles, may now be travelled in thirty-seven hours. First-class fares average 1.73 *d.* per mile; second-class, .86 *d.* per mile; and third-class, .36 *d.* per mile. Of the whole number of passengers 94 per cent travelled in third-class cars, 4.78 per cent in second-class cars, and only 1.12 per cent in first-class cars.

The percentages for working expenses, taken from lines from which the published returns were complete, and setting them against those taken from the complete returns of 1864 for the United Kingdom, are pretty closely as below. We will add the same thing for New York, for 1866, referring again to the latter hereafter.

| | New York. | India. | United Kingdom. |
|---|-------------|-------------|-----------------|
| Maintenance of roadway and buildings, . | 29.5 | 26.3 | 18.73 |
| Motive power, | 30.2 | 37.3 | 27.76 |
| Repairs and renewals of cars, | 11.0 | 6.2 | 8.56 |
| Passenger and freight department, | 16.3 | 17.3 | 28.42 |
| Compensation for personal injury and goods, | 0.5 | 2.4 | 1.60 |
| Miscellaneous, | 12.5 | 10.5 | 14.93 |
| | <hr/> 100.0 | <hr/> 100.0 | <hr/> 100.00 |

Freight in India is arranged in five classes, paying from 1*d.* to 7*d.* per ton per mile.

We do not purpose to mention more particularly the many ways in which the welfare of the passenger by train in this country is not sufficiently attended to. If travelling by railroad were more comfortable, or in other words less disagreeable, it is reasonable to suppose that a class of people to whom the price of fares has become a matter of small importance would travel oftener, and that railroad companies would find their receipts increased. And we think that railroad managers here might take many useful lessons from the European system, which system, we may add, would probably more often meet the approval of the traveller from this side of the water were it not for his reflections on being compelled to seat himself in a compartment with few companions, and to run the risk of a trip without the familiar bell-rope stretched above his head. We have nothing to do with criticising the English railway

system ; our object being rather to find something about it to praise, and, as far as practicable, to imitate usefully. But with regard to the compartment carriages, their use or disuse is evidently a matter of taste and habit.

The managers of two of the favorite routes between New York and Boston have placed compartment cars on their respective lines within five years past. These cars are luxuriously fitted up, and persons who care for comparative seclusion, wide seats, and fresh air, without annoyance to too many of their fellow travellers, can secure all these comforts by paying a small additional price for their tickets. And as to the want of a bell, there can be no harm in remarking that the reluctance on the part of English railway managers to adopt the simple plan in use in this country seems to be reasonable, because, though we have travelled a great deal by train since the adoption of the bell and decidedly approve of it for trains here, we happen to have seen it pulled improperly oftener than otherwise.

It would be extremely difficult to institute a comparison which would be valuable between the cost of working the railways of Great Britain and the United States. The differences in the price of labor and fuel, and in the engineering character of the lines, are enough to deter one from attempting it in the hope of arriving at a result in any degree adequate to the labor of the undertaking. The financial management of several well-known companies in one country or the other is the subject of frequent articles in the newspapers, and seems to be very bad, the faults being more or less identical. Indeed, we have just received a paper containing a severe criticism of the accounts published by one company in Great Britain, where the writer employs very much the same expression we have already made use of in allusion to the demoralizing influence of a seat as one of a Railway Board of Directors. But we will set down here several of the items which go towards making up the whole working expenses of the two systems respectively. It will then be seen in what proportion they each influence the dividend, and also in what direction it is most worth while to try to economize.

The working expenses of English railways may be stated at from 48 to 52 per cent of the gross receipts. The work-

ing expenses of the railways of this country, so far as we are in possession of official returns, range from 52 to 76 per cent of their gross receipts. And if we take the New York returns and make up the accounts as near as may be to correspond with those of the English returns, we shall have for the principal items the following per cent of working expenses : —

| | For New York. 1866. | For the United Kingdom. 1862. |
|---------------------------------------|------------------------|----------------------------------|
| Maintenance of roadway and buildings, | 29.5 | 18.99 |
| Motive power, | 30.2 | 27.79 |
| Repairs and renewals of cars, | 11.0 | 8.71 |
| Passenger and freight department, | 16.3 | 27.95 |
| Compensation for personal injury, | 0.4 | 1.11 |
| Damages to goods and property, | 0.1 | 0.48 |
| Rates, taxes, and government duty, | 5.2 | 6.81 |
| Miscellaneous, | 7.3 | 8.16 |

Our time and space are limited, and we must therefore hasten to a conclusion, in the hope that the figures we have set down, if not the statements we have made, may lead stockholders and managers to study the question of Railway Reform for the sake of their credit as well as their money. Here we will mention — though it must now be done briefly — the “National Anti-Monopoly Cheap Freight Railway League,” — a combination, so far as we have been able to inform ourselves, intending to make railroads free to the trains of all companies, or individuals, under certain indispensable restrictions; to adopt a slow rate of speed, and such systematic management as will allow of the incessant passage of trains at very short intervals of time, thereby meaning to reduce the cost of transportation and increase the amount of business. We believe it is not proposed to reduce the speed of passenger trains, but to build lines chiefly for freighting purposes, or to add more lines of rails to existing roads; and we are not aware that there is anything new in this. It was long ago proposed to make railroads free to the public on the payment of tolls, but there are obvious and very serious difficulties still in the way of adopting such a course generally; and as regards the cost of transportation, that is very much influenced by elements distinct from the mere amount of business, though of course an inces-

sant traffic ought to be more remunerative than an intermittent one. There are railways already so systematically worked that trains run upon them in as close succession as would be those proposed by the League. In fact, the scheme embraces questions of outlay and profit too intricate for hasty discussion. They are matters for estimate or calculation beyond the province of the superficial observer.

The reform we advocate is one of much more simple character, as well as of more immediate result, requiring no additional expense, and perhaps being the first step necessary towards the most important objects aimed at by the League. We think, indeed, that the railroad system of the country is susceptible of great improvement, and that it may be made to afford more accommodation in business and greater convenience to the traveller, with more public security against accident, and all this without needing any radical change. Its working organization is at present imperfect, and a large proportion of the officials who hold the more responsible places might be better qualified for their occupation. It has been seen that the expenses incurred for motive power, repairs of equipments, and maintenance of the line amount to seventy per cent of the whole expense of working. All inventions, therefore, which seem likely to economize fuel, to make the superstructure smoother and more durable, and to improve the machinery, ought to be reasonably encouraged, while efforts should be constantly making, through an interchange of information, to take advantage of the results of experience gained elsewhere, — otherwise it will be found that there has been relatively a steady annual increase of expense in all the departments just now named, and, finally, there should be a school for railway management by means of a regular system of promotion in every department of a railroad in operation, — to be relied upon as a matter of course, for the encouragement of faithful and efficient service. Those employed would then look to their own companies for long engagements, and would be less eager to find indirect means of increasing their remuneration.